REMARKS

Claims 1-51 are in the case and presented for consideration. Claims 1, 12, 16, 35, 42 and 47 have been amended. The support for this Amendment can be found in the Specification, for example, Page 17, Lines 17-22. No new matter has been added.

Claims 1-3, 7, 9, 10, 12, 13, 15-18, 22, 24, 25, 32-37, 39-45 and 47-50 have been rejected under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Patent 5,718,241 (Ben-Haim et al.) in view of U.S. Patent 5,385,146 (Goldreyer). Claims 4-6, 14, 19-21, 26-31, 38, 46 and 51 have been rejected under 35 U.S.C. § 103 (a) as being unpatentable over Ben-Haim et al. and Goldreyer in view of U.S. Patent 6,104,944 (Martinelli). Claims 8, 11 and 23 have been rejected under 35 U.S.C. § 103 (a) as being unpatentable over Ben-Haim and Goldreyer in view of U.S. patent 6,171,370 (Swanson et al.)

Turning now to the present invention, Claims 1, 12, 16, 35, 42 and 47 have been amended in order to more particularly point out the claimed present invention which includes a catheter for mapping of a chamber of a heart (Amended Claim 1 and Amended Claim 12), a method for generating an electrical map of a chamber of a heart (Amended Claim 16, Amended Claim 35, and Amended Claim 42), and apparatus for generating an electrical map of a chamber of a heart (Amended Claim 42 and Amended Claim 47). It is important to note that none of the prior art references of record describe, suggest or even infer a catheter, method for generating an electrical map of a heart chamber, or an apparatus for generating electrical map of a heart chamber having a catheter comprising a body and an array of non-contact electrodes linearly arranged along a longitudinal access of the body and a contact electrode at the distal tip of the body (found in Amended Claim 1, Amended Claim 16, Amended Claim 42), and at least one location sensor on the catheter body for determining a location of the non-contact electrodes and the location of the contact electrode (for those amended claims recited above), wherein the location of the non-contact electrodes and contact electrode (where applicable) determined by the at least one location sensor defines a cloud of space representing a minimum volume of the heart chamber. These references also fail to disclose, suggest or infer a method for generating an electrical map of a heart chamber utilizing the novel catheter according to the present

invention outlined above in conjunction with the additional novel steps for utilizing the catheter in order to determine a minimum volume of the heart chamber using the non-contact electrodes.

Accordingly, by this Amendment, and for the reasons outlined above, the claimed present invention as amended, including the dependent claims therefrom, are believed to be both patentably distinct and non-obvious over the cited prior art references and favorable action is respectfully requested.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claim 1. (Twice Amended) A catheter for mapping a chamber of a heart comprising:

a body having a proximal end and a distal end, said distal end having a distal tip;

a contact electrode at said distal tip;

an array of non-contact electrodes on said distal end of said body, said array having a proximal end and a distal end, wherein said non-contact electrodes are linearly arranged along a longitudinal axis of said body; and

at least one location sensor on said distal end of said body for determining a location of said contact electrode and a location of said non-contact electrodes, the location of the non-contact electrodes determined by said at least one location sensor defining a cloud of space representing a minimum volume of the chamber of the heart.

Claim 12. (Twice Amended) A catheter for mapping a chamber of the heart comprising:

a body having a proximal end and a distal end, said distal end having a distal tip;

an array of non-contact electrodes on said distal end of said body, said array having a proximal end and a distal end, wherein said non-contact electrodes are linearly arranged along a longitudinal axis of said body; and

at least one location sensor proximate to said distal tip for determining a location of said non-contact electrodes, the location of said non-contact electrodes determined by said at least one location sensor defining a cloud of space representing a minimum volume of the chamber of the heart.

Claim 16. (Twice Amended) A method for generating an electrical map of a chamber of a heart, said map depicting an electrical characteristic of the chamber as a function of chamber geometry, said method comprising the steps of:

a) providing a catheter comprising a body having a proximal end and a distal end, said distal end having a distal tip; a contact electrode at said distal tip; an array of non-contact electrodes on said distal end of said body, said array having a proximal end and a distal end, wherein said non-contact electrodes are linearly arranged along a

longitudinal axis of said body; and at least one location sensor on said distal end of said body;

b) advancing said catheter into said chamber of said heart;

c) determining a location of said contact electrode and a location of said non-contact electrodes using said at least one location sensor wherein the location of said non-contact electrodes defines a cloud of space;

[c] d) contacting a wall of said chamber of said heart with said contact electrode at a plurality of contact points;

[d] e) acquiring electrical information and location information from each of said electrodes and said at least one location sensor, respectively, said acquisition taking place over at least one cardiac cycle while said contact electrode is in contact with each of said contact points; and

f) determining a minimum volume of said heart chamber using the location of said non-contact electrodes;

[e] g) generating an electrical map of said heart chamber from said acquired location and electrical information.

Claim 35. (Twice Amended) A method for generating an electrical map of a chamber of a heart, said map depicting an electrical characteristic of the chamber as a function of chamber geometry, said method comprising the steps of:

a) providing a catheter comprising a body having a proximal end and a distal end, said distal end having a distal tip; an array of non-contact electrodes on said distal end of said body, said array having a proximal end and a distal end, wherein said non-contact electrodes are linearly arranged along a longitudinal axis of said body; and at least one location sensor proximate to said catheter distal tip;

b) advancing said catheter into said chamber of said heart;

c) determining a location of said non-contact electrodes using said at least one location sensor wherein the location of said non-contact electrodes defines a cloud of space;

[c] d) contacting a wall of said chamber of said heart with said catheter distal tip at a plurality of contact points;

[d] e) acquiring electrical information and location information from each of said non-contact electrodes and said at least one location sensor[s], respectively, said acquisition taking place over at least one cardiac cycle while said catheter distal tip is in contact with each of said contact points; [and]

f) determining a minimum volume of said heart chamber using the location of the non-contact electrodes; and

[e] g) generating an electrical map of said heart chamber from said acquired location and electrical information.

Claim 42. (Twice Amended) Apparatus for generating an electrical map of a chamber of a heart, said map depicting an electrical characteristic of the chamber as a function of chamber geometry, said apparatus comprising:

a catheter including a body having a proximal end and a distal end, said distal end having a distal tip; a contact electrode at said distal tip; an array of non-contact electrodes on said distal end of said body, said array having a proximal end and a distal end, wherein said non-contact electrodes are linearly arranged along a longitudinal axis of said body; and at least one location sensor on said distal end of said body for determining a location of said contact electrode and a location of said non-contact electrodes, the location of the non-contact electrodes determined by said at least one location sensor defining a cloud of space representing a minimum volume of the chamber of the heart; said catheter being adapted to contacting a wall of said chamber of said heart with said contact electrode at a plurality of contact points; and a signal processor operatively connected to said catheter for acquiring electrical information and location information from each of said contact electrode and said non-contact electrodes and location sensors, respectively, over at least one cardiac cycle while said contact electrode is in contact with each of said contact points, said signal processor also generating an electrical map of said heart chamber from said acquired location and electrical information.

Claim 47. (Twice Amended) Apparatus for generating an electrical map of a chamber of a heart, said map depicting an electrical characteristic of the chamber as a function of chamber geometry, said apparatus comprising:

a catheter including a body having a proximal end and a distal end, said distal end having a distal tip; an array of non-contact electrodes on said distal end of said body, said array having a proximal end and a distal end, wherein said non-contact electrodes are linearly arranged along a longitudinal axis of said body; and at least one location sensor proximate to said catheter distal tip for determining a location of said non-contact electrodes, the location of said non-contact electrodes determined by said at least one location sensor defining a cloud of space representing a minimum volume of the chamber of the heart; said catheter being adapted to contacting a wall of said chamber of said heart with said catheter distal tip at a plurality of contact points; and a signal processor for acquiring electrical information and location information from each of said electrodes and location sensors, respectively, over at least one cardiac cycle while said catheter distal tip is in contact with each of said contact points; said signal processor also generating an electrical map of said heart chamber from said acquired location and electrical information.